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FREQUENCY AND RISK FACTORS OF SEROMA FORMATION AFTER BREAST CONSERVATION SURGERY IN A HIGH VOLUME CENTER

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Abstract

Objective: *To determine the frequency of seroma formation after breast conservation surgery in a high volume center and to determine the association of risk factors of seroma formation after breast conservation surgery in a high volume center*

Study Design: *Cross sectional study*

Study place and period: *Department of Surgery, Shaukat Khanum Memorial Hospital, Lahore from 01 October 2024 till 31 March 2025*

Methodology: *After meeting the selection criteria and taken approval from ethical review board total 100 patients were enrolled. Seroma was studied, characterized as an evident accumulation of fluid in axilla or under skin flaps. These were further separated into two groups and risk factors were evaluated in both groups. Data was analyzed in SPSS v.23.0. Odds ratio was calculated to measure association of seroma formation with risk factors with OR>1 as significant.*

Results: *In this study the mean age & BMI of the patients was 42.47 ± 9.78 years & 27.75 ± 5.06 kg/m² respectively. Seroma occurred in 33% of patients. Most were >40 years (61%) and had tumors <5 cm (53%). Age >40 years (44.3% vs 15.4%, p=0.003; OR=4.37) and tumor size >5 cm (47.2% vs 17.0%, p=0.001; OR=4.35) were significantly associated with seroma formation.*

Conclusion: *The frequency of seroma formation is high after breast-conserving surgery in a high-volume center. Although the sanitization and pre- and post-surgical care meets all standards.*

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INTRODUCTION:

Patients with breast cancer have benefited immensely from breast-conserving treatment. Partial excision of the diseased breast plus postoperative adjuvant radiation to the preserved breast comprise breast-conserving therapy.[1] Breast cancer is one of the most prevalent cancers in the world, with an annual incidence of 2.1 million new cases.[2] Mastectomy is a useful therapeutic option, depending on the indication. However, this technique poses a significant difficulty for both the patient and the surgeon because of the prevalence of postoperative seroma. Seroma development is thought to be the most common complication following breast surgery, with an incidence range of 3 to 85%.[3, 4] After mastectomy surgery, it is a common and difficult complication with a high incidence rate. [5]

Patients in Pakistan often have late-stage breast cancer because of a variety of circumstances.[6] In Pakistan, there is a lack of consistent data

regarding the factors that contribute to seroma formation following mastectomy. The incidence of seroma formation following mastectomy has been reported in a few studies to range from 24% to 27%; however, a thorough explanation of the contributing causes has not been published.[7] One of the most frequent side effects of modified radical mastectomy is reported to be seroma development.[8] Although the exact cause of post-mastectomy seroma is unknown, it is generally acknowledged to be complex. The research has documented correlations with patient age, obesity, hypertension, breast size, lymph node status, and surgeon-specific drain and quilting procedures.[9]
The purpose of this study was to ascertain the prevalence and risk factors of seroma formation following breast conservation surgery. The chance of seroma production following breast surgery is considerable, according to published research. The development of seroma is significantly correlated with a number of factors. However, there was no local data accessible and a variety of statistics was provided. Therefore, the purpose of this study was to determine the precise incidence of seroma in the local community following breast conservation surgery as well as the degree of factors linked to seroma production. This would assist patients enjoy better results, enhance our practice, and achieve magnitudes to apply findings in local settings. Thus, to assess the degree of seroma development and related variables following surgery in a high volume facility.

METHODOLOGY

After taking approval from Institutional Review Board, this cross sectional study was carried out at the Department of Surgery, Shaukat Khanum Memorial Hospital, Lahore from 01 October 2024 till 31 March 2025. The calculated sample size was 100 that was determined using the WHO sample size calculator, based on 95% confidence level, 9% margin of error, using previously reported percentage of seroma formation 27.7% [10] following breast-conserving surgery. All the patients were enrolled by applying non-probability consecutive sampling technique, who fulfilled following criteria:

Inclusion criteria: For this study, we enrolled females who fall in age group 25-65 years, underwent breast conservation surgery of breast carcinoma.

Exclusion criteria: Females with metastatic disease, diabetes, thyroid disorder, renal dysfunction were excluded as they could affect the rate of seroma formation.
All the females were enrolled from surgical wards. Informed consent was obtained. Demographics detail and clinical parameters were also noted. All patients underwent examination and presence of seroma was noted if there was presence of clinically apparent fluid collection in the axilla or under the skin flaps. Seroma removal was managed with repeated needle aspirations. Then two groups were developed at this point and risk factors of seroma formation including age, tumor size, nodal involvement, preoperative chemotherapy, surgical instrument (electrocautery or scalpel), use of pressure garment, and duration of drainage was also noted in both groups for less than 10 days. Patients with seroma formation were managed as per standard protocol. A proforma was used to fill all the information.
All the collected data was entered and analyzed n SPSS version 23.0. Quantitative variables were presented in the form of mean ± SD and all the qualitative variables were presented in the form of frequency and percentages. Odds ratio was calculated to measure association of seroma formation with risk factors. OR>1 was considered as significant.

RESULTS:

A total of 100 patients were included in this study. The mean age was 42.47 ± 9.78 years, and the average BMI was 27.75 ± 5.06 kg/m². The mean duration of cancer was 6.30 ± 2.24 months. Regarding laterality, 38% of patients had left-sided disease, while 62% had right-sided involvement. A history of smoking was present in

5% of patients, and 18% were found to have anemia. The mean operative time was 59.89 ± 14.29 minutes, with an average intraoperative blood loss of 27.65 ± 8.17 ml. Seroma formation was observed in 33% of patients. **Table 1**

Table 1: Demographics and clinical parameters of females (n = 100)

Parameters		Frequency (%)
Age (Years)		42.47 ± 9.78
BMI (Kg/m^2)		27.75 ± 5.06
Duration of cancer (months)		6.30 ± 2.24
Laterality	Left	38 (38%)
	Right	62 (62%)
History of smoking		5 (5%)
Anemia		18 (18%)
Operative time (minutes)		59.89 ± 14.29
Intraoperative blood loss (ml)		27.65 ± 8.17

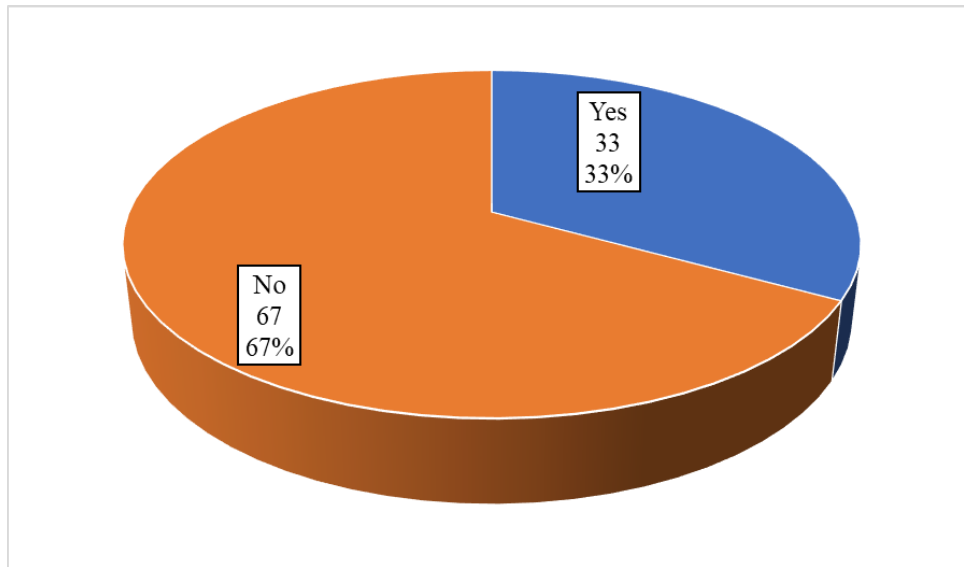

Figure-1: Seroma formation (n = 100)

The distribution of risk factors shows that 61% of patients were older than 40 years, while 39% were younger. The size of tumor was less than 5 cm in 53% of the patients and 53% were found to have a nodal involvement of 5 cm or more and only 12% showed no nodal disease. Most patients (87%), were preoperative chemotherapy with only 13% not getting any. All surgeries (100%) were performed using electrocautery, and none were done with a scalpel. In nearly every case (99%), a pressure garment was utilized (only 1 percent of those who did not use it). In terms of time of drainage, the majority of patients (72%) had the drainage removed within 10 days, and 28 percent had the drainage longer than 10 days.

Table 2: Risk factors leading to seroma formation (n = 100)

Risk Factors	Frequency (%)
Age > 40 years	61 (61%)
Tumor size >5 cm	53 (53%)
Nodal Involvement	88 (88%)
Preoperative chemotherapy	87 (87%)
Surgical Instrument	
Use of pressure garment	100 (100%)
Electrocautery	0 (0%)
Scalpel	99 (99%)
Duration of drainage	
< 10 days	18 (72%)
>10 days	7 (28%)

Risk factor analysis on seroma formation revealed that age and tumor size significantly related with the occurrence of seroma. Patients with age >40 years were found to have a much higher incidence of seroma formation than patients with age ≤40 years (44.3% vs 15.4%, p = 0.003), and had a higher likelihood of developing seroma (OR = 4.37, 95% CI: 1.5911.9). Similarly, patients with tumor size >5 cm showed a significantly higher seroma rate than those with larger tumors (47.2% vs 17.0%, p = 0.001), with an OR of 4.35 (95% CI: 1.71–11.06). In contrast, nodal involvement was not significantly associated with seroma formation (33.0% vs 33.3%, p > 0.999, OR = 0.983, 95% CI: 0.27–3.53), nor was preoperative chemotherapy (33.3% vs 30.8%, p = 0.854, OR = 1.125, 95% CI: 0.32–3.96). Likewise, pressure garments did not have any significant effect on the development of seromas (33.3% vs 0%, p = 0.481). In general, age >40 years and tumor size less than 5 cm were found to be significant predictors of seroma formation and others were not significant.

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Table 3: Association of seroma formation with risk factors (n = 100)

		Seroma Formation		Total	p-value	OR (CI)
		Yes	No			
Age > 40	>40	27 (44.3%)	34 (55.7%)	61 (100.0%)	0.003	4.37 (1.59-11.9)
	≤ 40	6 (15.4%)	33 (84.6%)	39 (100.0%)		
Tumor size >5 cm	Yes	25 (47.2%)	28 (52.8%)	53 (100.0%)	0.001	4.35 (1.71-11.06)
	No	8 (17.0%)	39 (83.0%)	47 (100.0%)		
Nodal Involvement	Yes	29 (33.0%)	59 (67.0%)	88 (100.0%)	>0.999	0.983 (0.27-3.53)
	No	4 (33.3%)	8 (66.7%)	12 (100.0%)		
Pre-op Chemotherapy	Yes	29 (33.3%)	58 (66.7%)	87 (100.0%)	0.854	1.125 (0.32-3.96)
	No	4 (30.8%)	9 (69.2%)	13 (100.0%)		
Use of pressure garments	Yes	33 (33.3%)	66 (66.7%)	99 (100.0%)	0.481	--
	No	0 (0.0%)	1 (100.0%)	1 (100.0%)		
BMI	>25	24 (33.8%)	47 (66.2%)	71 (100.0%)	0.789	1.13 (0.45-2.87)
	≤25	9 (31.0%)	20 (69.0%)	29 (100.0%)		
Anemia	Present	7 (38.9%)	11 (61.1%)	18 (100.0%)	0.557	1.37 (0.47-3.93)
	Absent	26 (31.7%)	56 (68.3%)	82 (100.0%)		
Smoking	Yes	2 (40.0%)	3 (60.0%)	5 (100.0%)	0.733	1.37 (0.21-8.66)
	No	31 (32.6%)	64 (67.4%)	95 (100.0%)		

DISCUSSION:

Modified radical mastectomy is a frequent surgical procedure for breast cancer, which is still one of the most common cancers afflicting women worldwide. The development of seroma, a collection of fluid in the dead area left by tissue dissection, is one of the most common and annoying postoperative consequences. In individuals following mastectomy and other breast procedures, the rate of seroma formation might vary from 15% to 81%.[11-13]

In our study, seroma formation was observed in 33% of patients. Regarding risk factors, age greater than 40 years and tumor size >5 cm were identified as significant predictors of seroma formation, whereas nodal involvement, preoperative chemotherapy, and the use of pressure garments showed no significant association.

According to a study by Qasmi et al., seroma was present in 37 out of 159 individuals (23.27%). Axillary lymph node presence ($p=0.032$) and postoperative infection ($p<0.001$) were significant surgical factors. Compared to our study, which was cross-sectional in nature, their sample size was larger and their design was retrospective observational. Despite these methodological variations, the risk factors for surgery were similar in both trials; however, the overall rate of seroma formation was lower in the Qasmi et al., study than in ours.[14]

In a similar study, Suresh et al., discovered that following breast conservation surgery, seroma development occurred in 27.7% of cases. Seroma development was associated with a number of risk factors, including age >40 years (95.7% vs. 66.7%), tumor size >5 cm (60.9% vs. 33.3%), nodal involvement (47.8% vs. 78.3%), and no preoperative treatment (91.3% vs. 66.7%). The difference was significant ($p<0.05$).[10] The aforementioned risk variables for seroma formation following surgery were also included in our study. Previous research has found that risk factors for post-operative seroma formation include the patient's age, hypertension, greater body mass index, surgical technique, and increased drain output during the first 24 hours.[15, 16]

Our findings is consistent with Hashemi et al.'s observation that seroma production occurred in 34.8% of instances following breast conservation surgery. Age >40 years (78.2% vs. 67.0%), tumor size >5 cm (23.6% vs. 21.3%), nodal involvement (73.6% vs. 65.7%), electrocautery (85.5% vs. 77.7%), no use of pressure garments (78.2% vs. 74.8%), no preoperative chemotherapy (16.4% vs. 9.7%), and drainage for <10 (84.9% vs. 79.8%). However, the difference was not statistically significant ($p>0.05$).[17] Ali et al., also found similar results.[18] In our study all the patients went through electrocautery procedure.

In contrast to our research, Eldamshety et al. reported that seroma production after breast cancer surgery was not significantly predicted by age, body weight, the affected breast side, the location, or the size of the breast mass. In contrast, age and breast mass size were found to be linked to the development of seromas in our study. The different study population and methods could be the cause of the contradictory results.[19]

Our seroma rate was within the range of rates reported by different studies, and our findings are generally consistent with the literature that is currently accessible. Age over 40 and tumor size greater than 5 cm were found to be significant predictors; nodal involvement, preoperative chemotherapy, and the use of pressure garments were not significant predictors, which is supported by other studies of a similar kind. Variations in study design, patient demographics, and surgical techniques can likely account for disagreements with some research. The body of research demonstrates the complexity of seroma production and the importance of patient-specific factors in its prediction.

Limitations of the study

When discussing the current study's findings, it is important to take into account some of its shortcomings. First of all, the cross-sectional design of the study makes it impossible to demonstrate a causal association between the

identified risk variables and seroma production because it only collects data at one point in time rather than monitoring the patient over time. Second, the small sample size in our study may have reduced the statistical power and the applicability of our findings to broader patient populations. Third, because the study was conducted in a single facility, the results may not have external validity due to institutional differences in surgical techniques, patient selection, and postoperative procedures. Fourth, our analysis did not sufficiently address some of the potentially confounding variables that have been identified as risk factors in the prior literature, such as body mass index, hypertension, differences in the operative technique, and drain output during the first 24 postoperative hours. As a result, their effects on the occurrence of seroma cannot be totally eliminated. Finally, there may have been some measurement bias in the reported rates due to the subjective variations in the clinical diagnoses of seroma among different treating physicians. The current investigation's ramifications include the necessity for larger, multicenter, prospective investigations in the future to validate and expand upon their findings.

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CONCLSUION:

Based on this study, it can be concluded that the frequency of seroma formation after breast-conserving surgery in a high-volume center was 33%. Factors such as age >40 years and tumor size >5 cm were identified as significant risk factors associated with seroma formation.

CONFLICT OF INTEREST:

None.

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